

# Design and Construction of GSM Based Fire Alarm System using PIC Microcontroller

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## ABSTRACT

A fire alarm system is used our properties safe form fire. It can be designed in many ways in different components. Many expensive building must have their fire alarm systems. In market almost systems are indoor systems. The indoor systems can be known only the person who inside the building. So, this paper focus on the design and implementation of knowing the fire status from remote. This proposed system designed has two sensors. One is the smoke sensor and the other is temperature sensor. If these sensors sense the required amount of temperature and smoke, they send SMS to dedicated mobile use and alarm system to know remote person and indoor persons.

**KEYWORDS:** PIC microcontroller, smoke sensor, temperature sensor, LCD and GSM module

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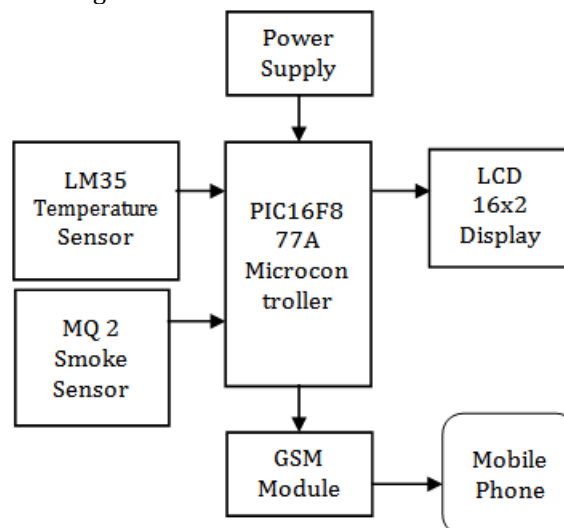
## INTRODUCTION:

Today, fire is one of the silent dangers among human society. Fire hazards can be fatal and denigrating for industrial and household security and also intimidate for human life. The best way to reduce these losses is to respond to the emergency situation as quick as possible, that need a standalone automatic fire detection system. This Fire alarm system provides the owner with the advantage of checking from distant location and taking immediate actions when an emergency message is received. For the demand of the market, it is easier to use and more safe than other type of fire alarm systems. It can use more easy and convenience. It can use whether the GSM line connection active. SMS based fire alarm system is very useful in remote locations where human interaction is limited. This proposed system can provide a safe, secure and efficient way for accidents. Using one of this detector low cost and quick-responsive fire/smoke detection and alarm system has been designed and implemented. The system is capable of sending alert messages via GSM network and activating siren at the premises. Due to the outbreak of fire that damage properties and life, there is need to locally design and construct of fire detector using GSM module, which can be building conveniently, offices, home also in industries which will be able to send text messages to the owner of the installed in premises. Furthermore, there is need to contribute to the economic growth of the nation and reduce the fire outbreak, while avoiding loss of properties. Lastly to put into practice the knowledge acquired in my field of studies. This paper

shows how to implement step by step of GSM base fire alarm system.

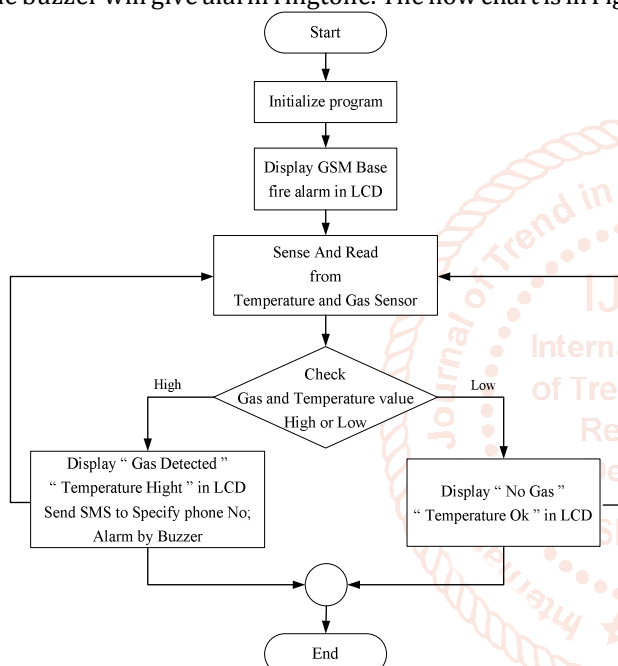
## OPERATION PRINCIPLE

The operation of the GSM base fire alarm system has mainly 6 components. They are MQ2 smoke sensor, LM 35 temperature sensor, PIC 16F887A microcontroller, LCD 16 x2, GSM module, GSM mobile phone and power supply as shown in Fig.1.



**Figure.1 Block diagram of GSM base fire alarm system using PIC microcontroller**

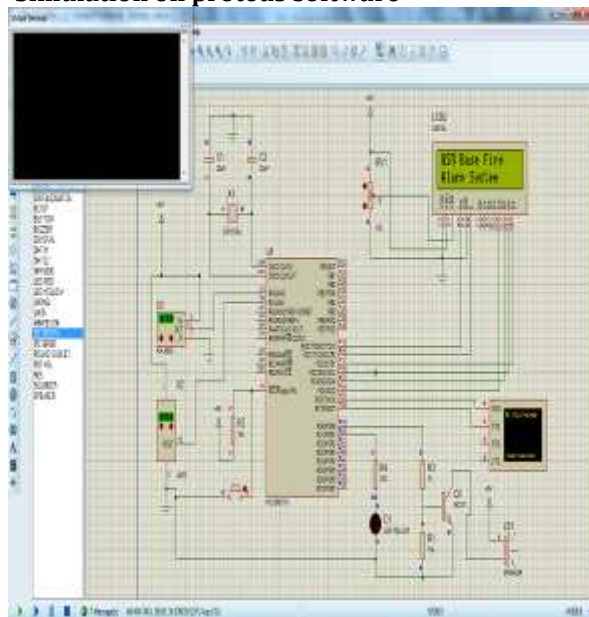
The GSM fire alert circuit setup the sensors of the GSM based fire alarm system are used LM35 and MQ2 for sensation of temperature and smoke. Secondly used PIC as the brain of the system, also known as controller. Finally, PIC activated GSM modem to sends SMS alert to the mobile user and LCD display which are used to display message of the process. Fire detector using PIC is to sense the surroundings occurrence of fire with help of LM35 temperature sensor, smoke sensor and send 3 SMS alerts to two mobile numbers stored inside the PIC program if fire is detected by using GSM module. In this system, the fire is detected with the help of LM35 fire detection sensor and MQ2 smoke detection sensor. Sensor sends a receiving signal from the sensor to the microcontroller, and then microcontroller sends an active signal to the other connected devices. When microcontroller gets input signal it gives the output to the GSM module and display output alarm in 16x2 LCD display. And then GSM module sends the information in the form of SMS to the dedicated mobile phone. When the system active the buzzer will give alarm ringtone. The flow chart is in Fig.2.



**Figure.2 Flow Chat of the GSM based Fire Alarm System**

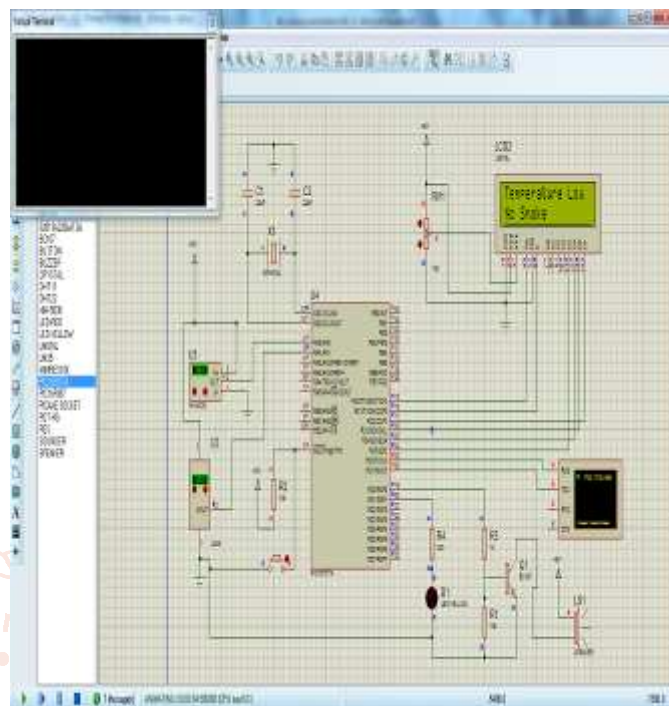
## HARD WARE AND SOFT WARE IMPLEMENTATION

### A. Simulation on proteus software



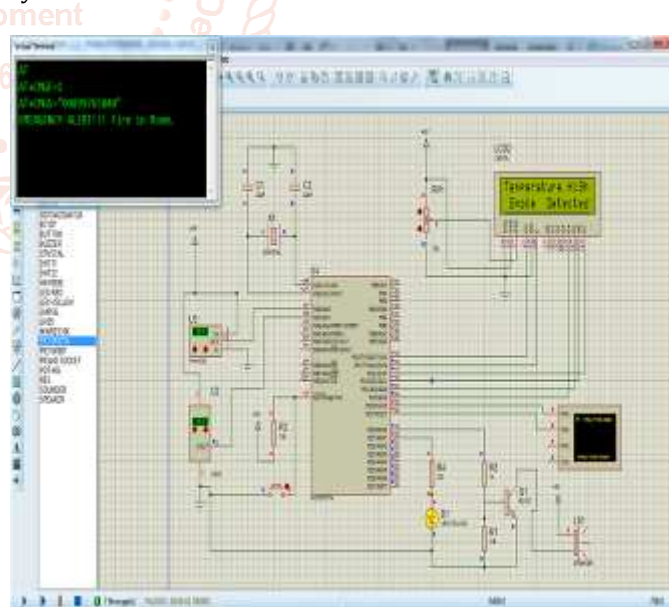
**Figure.3 Initial state of the system**

In this section, firstly, this system is initially design on proteus software. The following figures are the simulation result running on proteus software of GSM based fire alarm system using PIC microcontroller. Fig.3 is the simulation result running on proteus initial state of this system.



**Figure.4 Checking smoke and temperature detected state of the system**

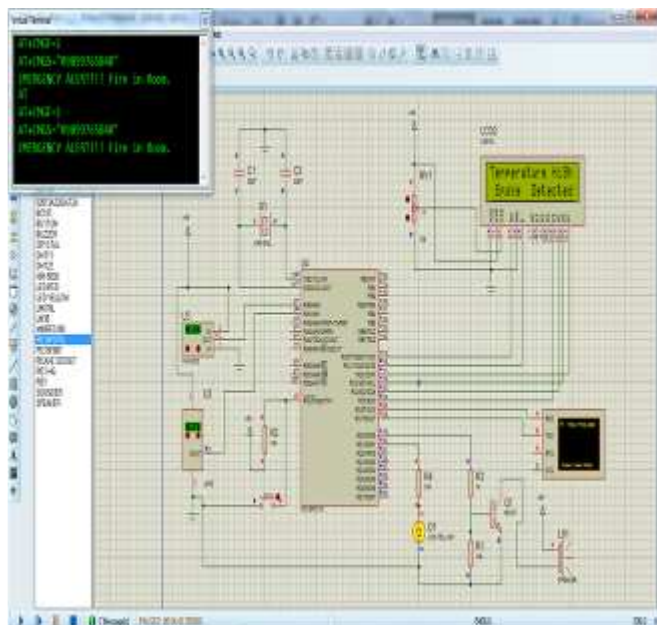
The Fig.4 describes the simulation result running on proteus which checks smoke and temperature detected state of this system.



**Figure.5 Sending information to the dedicated mobile phone**

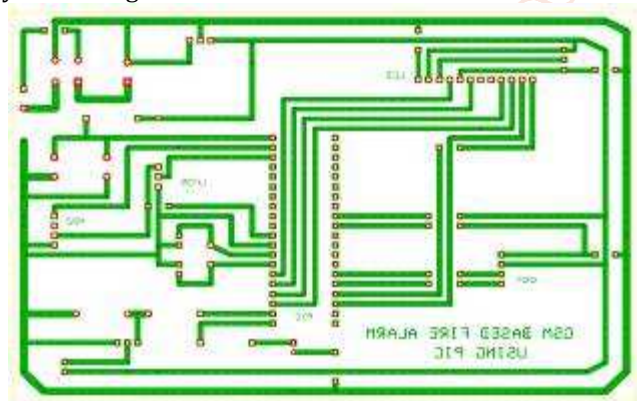
Fig.5 simulates the simulation result running on Proteus for smoke and temperature detective and sending information to the dedicated mobile phone state in the formed of SMS for GSM based fire alarm system using PIC microcontroller.





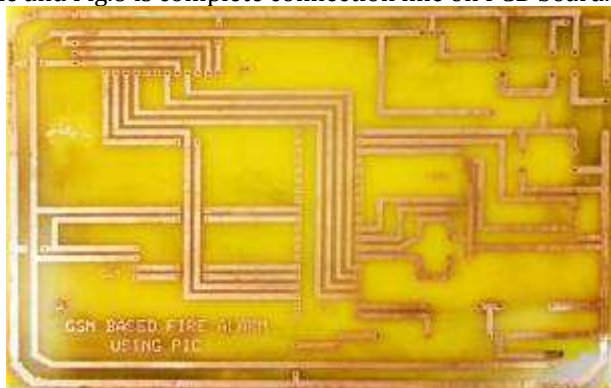
### Figure.6 Check and loop the system

Fig.6 presents the simulation result running on Proteus which check and loop the system for GSM based fire alarm system using PIC microcontroller.



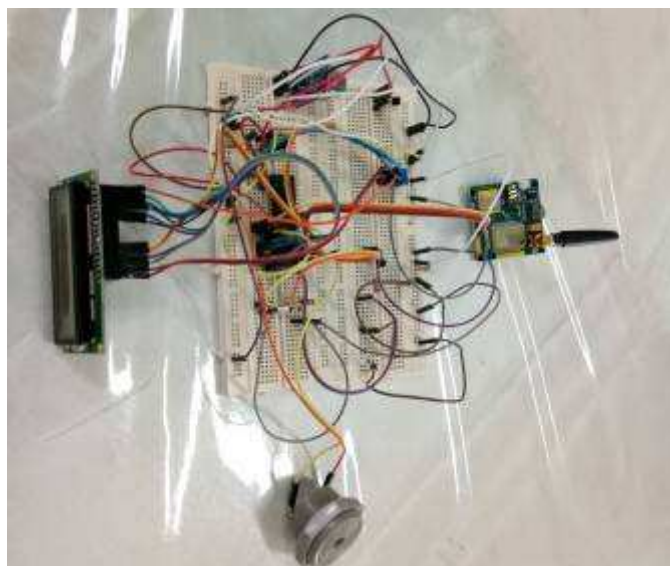
### Figure.7 Layout PCB Connection Line

Then draw the PCB circuit design using Express PCB software. The following Fig.7 is the layout PCB connection line and Fig.8 is complete connection line on PCB board.



### Figure.8 Complete Connection Line on PCB Board

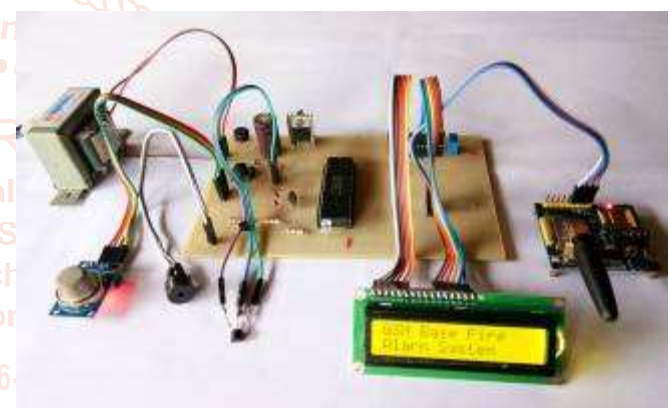
After uploading source code to PIC 16F877A, implement the system to PCB board. The main unit is the PIC 16F877A microcontroller and the GSM module. The inputs of the PIC is the output of the sensors and the sensors sense temperature and smoke. The PIC receives the signal from sensors and it gives to the GSM module, LCD, alarm and signal LED. The GSM module send sms to GSM mobile user. Here Fig.9 is the implemented on bread board.



### Figure.9 Implemented on Bread Board

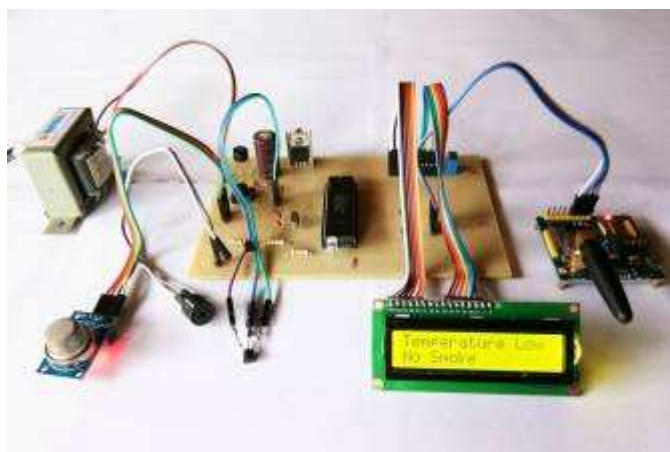
## Test and Result

In this system when the power is supplied after implementing, Fig.10 is the initial state of the GSM based alarm system.

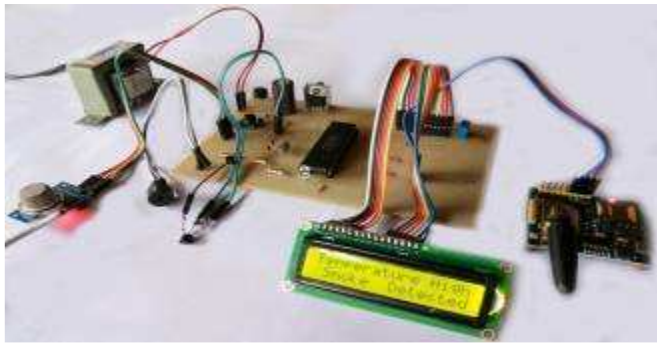


**Figure.10 Initial State of the GSM based Fire Alarm System**

The next state of the running system is sensing and reading from sensors. On LCD will show "Temperature Low and No Smoke" if there is no problem detected on the sensor. The following Fig.11 presents the test result of the sense and read state of the system.

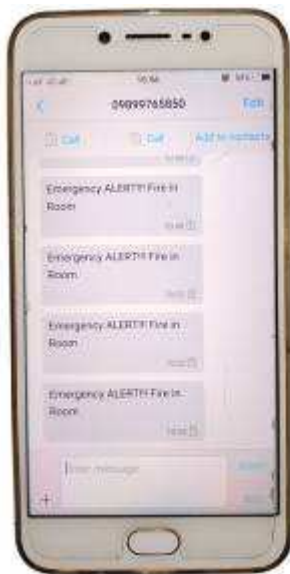


### Figure.11 Result of Sense and Read State of the System



**Figure.12 Temperature HIGH and Smoke detected**

Last state of the system running is smoke and temperature detected state and on LCD will show "Temperature High and Smoke Detected" if there is some problem detected on the sensor. The system will be active when the sensor sensation of heat or smoke within in 2s. The following figure is described the test result of smoke and temperature detected state of the system.



**Figure.13 The Receive SMS from the System**

When GSM module gets signals detected smoke and temperature from PIC and it sends information to the owner in the form of SMS over GSM network as "Emergency ALERT!!! Fire in Room". The Fig.13 expresses the receive SMS from the system.

## CONCLUSION

This system presents about GSM based fire alarm system using PIC 16F877A microcontroller. This system does not need a person to monitoring because the system monitor with the help of sensor. This system is a low cost; portable based on the instruments consists of LM35 fire sensor, MQ2 smoke sensor, GSM module, PIC microcontroller and voice alarm system. The components are performed three different operations, the input from the sensor given to the PIC microcontroller under different operation and PIC send the active signals to the alarm system when it reach to initialize values of the sensor configure by user.

During implementation and testing, the system gets some problem from sensor the PIC activated GSM module and voice alarm system. The GSM module also sends the

information to the dedicated mobile phone in the formed of SMS through GSM network. Although the message has been sends to the detected mobile phone, SMS alarm can receive only in a range of mobile network.

As a future work, this system is combined with water pumping system for detects fire automatically pumps out water for detection-fire. This system can not only GPS system to know the location but also video record system to record the condition of the fire detection system.

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